

WHAT IS CLAIMED IS:

1. A position detecting apparatus that detects a position of an object, comprising:

a position sensor that outputs at least two-phases of position detecting signals that change periodically or sinusoidally according to movement of the object;

a signal adjusting unit that performs gain and offset adjustment of each of the position detecting signals by using adjustment data;

a calculation unit that obtains a position of the object on the basis of the position detecting signals whose gains and offsets are adjusted;

a counter that counts a wave number of the position detecting signals from a reference position; and

a memory circuit that stores adjustment data corresponding to the wave number,

wherein the signal adjusting unit adjusts gains and offsets of the position detecting signals on the basis of the adjustment data corresponding to the wave number that is counted by the counter and is stored in the memory circuit.

2. The position detecting apparatus according to claim 1, further comprising a variability memory circuit storing gain and offset variability data of the position detecting signals corresponding to moving speed of the object,

wherein the signal adjusting unit detects moving speed of the object and adjusts gains and offsets of the position detecting signals

on the basis of variability data that is stored in the variability memory circuit and corresponds to the detected moving speed, and adjustment data corresponding to a wave number that is counted by the counter.

3. The position detecting apparatus according to claim 1, further comprising:

a temperature detector detecting ambient temperature of the position sensor; and

a variability memory circuit storing gain and offset variability data of the position detecting signals corresponding to temperature,

wherein the signal adjusting unit adjusts gains and offsets of the position detecting signals on the basis of variability data that is stored in the memory circuit and corresponds to temperature detected by the temperature detector, and adjustment data corresponding to a wave number that is counted by the counter.

4. The position detecting apparatus according to claim 1, wherein adjustment data corresponding to the wave number is obtained when the reference position of the object is adjusted, and is stored in the memory circuit.

5. The position detecting apparatus according to claim 1, wherein the memory circuit is volatile memory.

6. The position detecting apparatus according to claim 1, wherein the position sensor comprises a magnetic member periodically

magnetized, and a magnetic detector that relatively moves with the magnetic member in connection with movement of the object and outputs at least two phases of position detecting signals that change periodically or sinusoidally according to a magnetic change due to the movement of the object.

7. The position detecting apparatus according to claim 1, wherein the position sensor comprises an optical scale member having a reflecting surface whose shape periodically changes, and an optical detector that relatively moves with the optical scale member in connection with movement of the object and outputs at least two phases of position detecting signals that change periodically or sinusoidally according to quantity of received light from light reflected on the optical scale member, which changes due to the movement, among light projected to the optical scale.

8. An optical apparatus comprising:
an optical system; and
the position detecting apparatus according to claim 1 that detects a position of at least one optical element in the optical system.

9. The optical apparatus according to claim 8, further comprising:
a control unit controlling defocus correction of the optical system in connection with a temperature change,
wherein an output of the temperature detector is also used for control of the defocus correction.

10. A position detecting method of adjusting gains and offsets of at least two phases of position detecting signals that change periodically or sinusoidally and are outputted from a position sensor according to movement of an object, and obtaining a position of the object on the basis of the position detecting signals whose gains and offsets are adjusted, comprising:

a step of counting a wave number of the position detecting signals from a reference position;

a step of obtaining adjustment data corresponding to the wave number that is counted; and

a step of adjusting gains and offsets of the position detecting signals on the basis of the obtained adjustment data.

11. The position detecting method according to claim 10, further comprising:

a step of detecting moving speed of the object;

a step of obtaining gain and offset variability data of the position detecting signals corresponding to the detected moving speed; and

a step of adjusting gains and offsets of the position detecting signals on the basis of the obtained variability data and adjustment data corresponding to the counted wave number.

12. The position detecting method according to claim 10, further comprising:

a step of detecting ambient temperature of the position sensor;

a step of obtaining gain and offset variability data of the position detecting signals corresponding to the detected temperature; and

a step of adjusting gains and offsets of the position detecting signals on the basis of the obtained variability data and adjustment data corresponding to the counted wave number.

13. A position detecting apparatus that detects a position of an object, comprising:

a position sensor that outputs at least two-phases of position detecting signals that change periodically or sinusoidally according to movement of the object;

a signal adjusting unit that performs gain and offset adjustment of each of the position detecting signals by using adjustment data;

a calculation unit that obtains a position of the object on the basis of the position detecting signals whose gains and offsets are adjusted; and

a memory circuit that can store the adjustment data,

wherein the memory circuit maintains storing the adjustment data at least until the position detecting apparatus operates this time; and

wherein at the time of the operation start at this time, the signal adjusting unit performs the gain and offset adjustment by using the adjustment data which is stored in the memory circuit.

14. The position detecting apparatus according to claim 13, further comprising a volatile memory circuit that can store the adjustment

data volatilely,

wherein after the operation start at this time, the signal adjusting unit not only makes the adjustment data stored in the volatile memory circuit after obtaining it, and performs the gain and offset adjustment by using the newly obtained adjustment data.

15. The position detecting apparatus according to claim 13, further comprising a temperature detector detecting ambient temperature of the position sensor,

wherein the memory circuit stores gain and offset variability data of the position detecting signals corresponding to temperature; and

wherein the signal adjusting unit corrects the initial data on the basis of the temperature detected by the temperature detector, and the variability data stored in the memory circuit.

16. The position detecting apparatus according to claim 13, wherein the position sensor comprises a magnetic member periodically magnetized, and a magnetic detector that relatively moves with the magnetic member in connection with movement of the object and outputs at least two phases of position detecting signals that change periodically or sinusoidally according to a magnetic change due to the movement of the object.

17. The position detecting apparatus according to claim 13,

wherein the position sensor comprises an optical scale member having a reflecting surface whose shape periodically changes, and an

optical detector that relatively moves with the optical scale member in connection with movement of the object and outputs at least two phases of position detecting signals that change periodically or sinusoidally according to quantity of received light from light reflected on the optical scale member, which changes due to the movement, among light projected to the optical scale.

18. An optical apparatus comprising:

an optical system; and

the position detecting apparatus according to claim 13 that detects a position of at least one optical element in the optical system.

19. The optical apparatus according to claim 18, further comprising a control unit controlling defocus correction of the optical system in connection with a temperature change,

wherein an output of the temperature detector is also used for control of the defocus correction.

20. A position detecting method of adjusting gains and offsets of at least two phases of position detecting signals that change periodically or sinusoidally and are outputted from a signal detecting unit according to movement of an object, and obtaining a position of the object on the basis of the position detecting signals whose gains and offsets are adjusted, comprising:

a first step of making the adjustment data, used for the gain and offset adjustment, stored; and

a second step of performing the gain and offset adjustment by using the stored adjustment data as initial data when starting position detecting operation after the first step.

21. The position detecting method according to claim 20, further comprising:

a step of storing gain and offset variability data of the position detecting signals to a temperature change in the memory circuit;

a step of detecting ambient temperature of the position sensor;
and

a step of correcting the initial data on the basis of the detected temperature and the stored variability data.